VII.—ON SOME PARASITES OF FISHES NEW TO THE SCOTTISH MARINE FAUNA.

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Plate XVII.

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Preliminary Note.

Some time ago Dr Fulton, Scientific Superintendent to the Fishery Board, kindly handed to me for examination a specimen of *Trygon pastinaca*, Lin., which had been captured in the Dornoch Firth on October 22, 1903. This specimen measured about 14½ inches across the pectoral fins and about 24½ inches from the nose to the extremity of the very slender tail; it was thus not more than about the average size of this kind of fish, yet it yielded on examination no fewer than four different species of ectozoa. Two of these species belong to the Copepoda and two to the Trematoda, and only one of them, viz., *Brachiella pastinacæ*, van Beneden, appears to have been previously described. Descriptions and drawings of these apparently new forms are given here.

Moreover, while examining some organisms set aside from former collections, I found a specimen of *Lernæa lusci*, Bassett-Smith, obtained off Aberdeen in January, 1902; as this parasite has not before been recorded from Scottish waters, I have had a short description, with drawings of it, prepared for this paper.

I have further to state that at the end of this paper will be found a description and drawing of a very curious Natural History group consisting of a larval fish, somewhat emaciated, and two small Crustaceans, which appear to be attacking the fish; for this interesting specimen I am indebted to my friend and colleague, Dr Henry Charles Williamson.

The drawings have been prepared by my son, Mr A. Scott, A.L.S.

I propose to describe the various organisms mentioned in the order in which they are referred to above.

PART I.—COPEPODA PARASITA.

Fam. Dichelestidæ.

Genus *Eudactylina*, van Beneden (1853).

Eudactylina minuta, T. Scott. Pl. xvii., figs. 111.

Description of the Female.—The length of the specimen represented by the drawing (fig.1), measuring from the forehead to the end of the furcal

joints, is about 1·1mm.(about $\frac{1}{23}$ of an inch), but that represented by figure 2 is slightly larger, and measures about 1·4 mm. The segments, especially along their dorsal aspect, are rough with minute scattered spines. The body is slender, as in the species previously described, but the fourth and fifth segments are rather more dilated than the others. The cephalosome is about equal in length to that of the first two segments of the metasome combined. The first segment of the metasome is a small one, while the next two are each rather longer and stouter than the one immediately preceding; the last segment of the metasome is considerably smaller than the third one. The segmentation of the urosome (abdomen) somewhat resembles that of *Eudactylina similis*, A. Scott.

The antennules, which are short and stout, are apparently five-jointed, as in those of the species referred to, and their armature is also similar to that of *Eudactylina similis*, but, on the other hand, there is a distinct difference in the proportional lengths of the joints,—the third being longer than the second joint and the fourth scarcely twice as long as the ultimate one (fig. 3).

The antennæ, which are moderately elongated, have a general resemblance in their form and structure to those of the other described species; but the second joint, which is about as long as the third, is produced on the inner aspect and near the distal end so as to form a single stout and prominent spine, and a single powerful hook-like spine with a thickened base carrying a few small setæ is articulated to the extremity of the third joint (fig. 4).

The mandibles and maxillæ do not present any marked difference from those of *Eudactylina acuta*, van Beneden.

The first maxillipeds, which resemble the same appendages in *Eudactylina similis*, are armed with a moderately stout terminal claw, and the end joint is furnished with a row of minute course denticles along the inner edge (fig. 5).

The second maxillipeds are large and strong and form powerful chelæ; they are somewhat similar in structure to those of *Eudactylina similis*, but the extremity of the claw which impinges against the lower spoon-like process has the stout apical tooth with a rounded hood-like covering (fig. 6).

In the first pair of thoracic feet both branches are two-jointed, and both are moderately stout; the inner branches are sparingly fringed with minute setæ, and armed with two apical spines of unequal length; the outer branches, which are rather shorter than the inner, are each furnished with a fringe of minute setæ on the outer margin of the first joint, while the end joint bears several spines round its outer margin and apex; the inner spine is of moderate length, but the others are small (fig. 7).

The structure of the second pair has a general resemblance to that of the same pair in *Eudactylina similis* and *E. acuta*. The inner branches, which are distinctly three-jointed, are considerably smaller than the outer ones, the first joint bears a longitudinal row of small spines on its inner aspsct, while the end joint carries two apical spines of moderate but unequal length. The outer branches are stout and elongated, and, like the inner ones, appear to consist of three joints, but the articulation between the first and second joints is apparently nearly obsolete; two short spines which have their bases dilated spring from the outer margin and near the distal end of the elongated first joint; the third joint, which is short and rounded at the extremity, is provided with a single and moderately stout subterminal spine, as shown in the drawing (fig. 8).

The third and fourth pairs are nearly alike, and resemble the same two pairs in *Eudactylina similis*, except that the inner branches are furnished with a number of scattered spinules on their outer aspect; the outer branches are each of them rounded at the extremity, and provided with

a single elongated terminal seta, there are a few spines on the outer margins of the second and third joints, while the first joint bears a fringe of minute spines along its outer edge (fig. 9).

The fifth pair, which are broadly foliaceous and resemble in their general outline the same appendages in *Eudactylina acuta*, van Beneden, are furnished with several transverse rows of minute spines and three apical setæ (fig. 10).

The furcal joints, which are rather longer than the last abdominal segment, are each of them armed with two terminal spines—a stout one at the apex and a somewhat smaller one on the outer edge, as shown in the figure; a small seta springs also from near the middle of the outer margin (fig. 11).

Habitat.—On the gills of a specimen of the "Sting Ray," *Trygon pastinaca*, Linn., captured in the Dornoch Firth on October 22, 1903. No males of the *Eudactylina* were observed. The fish, as already stated, measured about 14½ inches across the pectoral fins, while its length from the snout to the extremity of the tail is about 24½ inches.

Remarks.—This *Eudactylina* appears to differ from previously described species by its smaller size—being little more than half the length of the smallest hitherto recorded, and from its being found on a different host. But there are also structural differences which separate it from other forms. I will recapitulate one or two of these: it differs in the proportional lengths of the joints of the antennules, in the armature of the antennæ, in the armature of the first maxillipeds, in the structure of the second pair of thoracic feet, and in the proportional lengths of the segments of the thorax.

Though a number of specimens were obtained, only a small proportion of them were in good condition for dissection.

Eudactylina acuta, Van Beneden.

1853. *Eudactylina acuta*, Van Beneden, Bull. Acad. Roy. Belg., vol. xx., pt. 1, p. 235; Mem. Acad. Roy. Belg. (1861), p. 150, Pl. xxv.

In my notes on the parasites of fishes in Part III. of the Twentieth Annual Report of the Fishery Board for Scotland (published October 2nd, 1902), I describe the occurrence of *Eudactylina acuta* on the gills of an Angel-fish, *Rhina squatina* (Lin.), captured in January 1902 about eight or nine miles south-east from Buchan Ness, and the description of the parasite is illustrated by a series of drawings. My son had already obtained the same *Eudactyline* on the gills of Angel-fishes captured in the Irish Sea, but there did not appear to have been any previous record of it from Scotland.

Through the kindness of Mr. Robert Duthie, Fishery Officer—presently stationed at Girvan, Ayrshire—I am enabled to record this interesting parasite for the second time from Scottish waters, which, like the specimens previously referred to, was found on the gills of an Angel-fish. This fish, which was captured by turbot-net fishermen in the seaward part of the Clyde estuary and landed at Girvan on May 25th (1904), was secured by Mr. Duthie, who kindly forwarded it to me for examination. The fish was an immature female, and measured two feet nine and a-half inches (nearly 83 centimetres) from the front of the head to the extremity of the caudal fin. This *Eudactyline* is an addition to the parasitic Copepod-fauna of the Clyde.

Lernæa lusci, Bassett-Smith. Pl. xvii., figs. 12 and 13.

1896. *Lernæa lusci*, Bassett-Smith, Ann. and Mag. Nat. Hist. (6), vol. xviii., p. 13, pl. iv., fig. 6.

The form described under this name is considerably smaller than the

more common *Lernæa branchialis*, and hitherto it appears only to have been observed on the gills of the Brassie or Whiting Pout (*Gadus luscus*, Linn.). The specimen I have to record was obtained on the gills of a Brassie captured about ten miles off Aberdeen on January 16, 1901. This parasite measures a little over half an inch from the head to the end of the genital segment. The neck is slender and short, and the appendages of the cephalon are moderately developed. Dr. Bassett-Smith describes the posterior appendage as being sometimes as long as the neck, which is also characteristic of the specimen now recorded (fig. 13). The genital segment is considerably dilated and strongly sigmoid, except at the posterior end where, in marked contrast to *Lernæa branchialis*, it is only slightly curved; the twisted egg sacs are proportionally not so slender as in that species.

Lernæa lusci does not appear to have hitherto been recorded from Scottish waters, having been probably regarded as a form of *L. branchialis*. Figure 12 shows the specimen attached to the gill-arch of the fish.

Brachiella pastinacæ, Van Beneden.

1851. *Brachiella pastinacæ*, Van Beneden, Ann. des. Sci. Nat., 3rd ser., t. xvi., p. 118, pl. iv., figs. 8, 9.

Two specimens of this *Brachiella* were obtained in the nasal fossæ of the *Trygon* in which the *Eudactylina* just described was found. One specimen occurred in each of the two fossæ. These two specimens which were posted to the artist along with a few other things in order to have drawings of them prepared, failed to reach their destination, and I am therefore unable to furnish figures of this species.

PART II.—TREMATODA.

Fam. Tristomatidæ.

Thaumatocotyle concinna, gen. et. sp. nov. Pl. xvii., fig. 15.

A large sucker-disc, so characteristic of several of the Trematoda, is attached to the distal end of the body by a very short stalk which is apparently flexible. The sucker is nearly circular in outline, and its ventral surface is divided into thirteen marginal compartments which are separated from each other by narrow muscular bands; the compartment at the lower end of the sucker is larger than any of the other twelve and is of the form of an equilateral triangle, the blunted apex of which is directed inwards and reaches fully half way toward the centre of the sucker; the other twelve marginal compartments are of nearly equal size and are subquadrate in form, as shown in the drawing (fig. 15). Two moderately slender rods spring from two adjacent muscular bands near the centre of the disc, and extending to the circumference of the sucker terminate in little hook-like processes—one on each side of the lower triangular compartment.

The anterior end, which terminates somewhat abruptly and has a broadly triangular outline, is bifurcated in the middle. On the ventral aspect, close to the margin on each side of the fork and extending from it to the outer angle, there are arranged three small discs which may probably function as suckers.

The length of the specimen represented by the figure is about 3 millimetres (nearly $\frac{1}{8}$ of an inch), while the breadth at the widest part is equal to about one fifth of the length; the body is flattened and in some specimens nearly transparent, so that the internal structure may to some extent be discovered.

This Trematode does not agree with any genus or species known to me.

Habitat.—In the nasal fossæ of *Trygon pastinaca*, captured in Dornoch Firth, October 1903.

Heterocotyle pastinacæ, gen. et sp. nov. Pl. xvii., fig. 14.

Several specimens of the Trematode described under this name were obtained on the same *Trygon pastinaca* with the form just recorded, but they were found not in the nasal fossæ but on the gills along with *Eudactylina minuta* described in the first part of this paper.

In this Trematode the posterior sucker is slightly oval in outline—the transverse diameter being greater than that which is longitudinal in the proportion of about 13 to 11. The edge of the sucker is indistinctly crenate, and its ventral surface is divided into eight compartments, which extend from the circumference to near the middle, where they are interrupted by a small diamond-shaped space representing the point of attachment of the sucker to the body. The two lowest compartments are of a slightly larger size than the four upper ones, but the compartment on each side is about double the size of the one immediately above. Moreover, these side compartments, together with the two lower ones situated between them, are each sub-divided into two portions by a circular line, as shown in the drawing (fig. 14). About the middle of the band which divides each large lateral compartment from the lower one, there is attached a short rod that terminates in a strong hook.

The body is of a narrow ovate form and is considerably depressed; the greatest width is equal to nearly three and a half times the length; the total length of the specimen represented by the drawing is only 1·44 mm. (about $\frac{2}{35}$ of an inch). The anterior end is narrowly truncate, and is without any lateral appendages, as in *Phyllonella* or *Placunella*, which it otherwise resembles.

Besides the occurrence of the four different kinds of parasites from the Sting Ray mentioned here, Prof. van Beneden has obtained on specimens of the same species of fish taken on the coasts of Belgium, not only the *Brachiella pastinacæ*—which he found both in the nasal fossæ and on the gills—but also *Lerneopoda galei* and *Ergasilina robusta*; the first he obtained in the nasal fossæ and the other on the gills. The same writer also records finding five different kinds of Cestoids in the intestines of *Trygon*.*

PART III.

Note on a Post-larval Fish Attacked by Podon leuckarti.

Plate XVII.—Fig. 16.

It is fairly well known to students of the Entomostraca that these organisms live to some extent on animal as well as on vegetable matter, and also that they do not always confine themselves to decaying substances, but that living specimens, if small enough and in a weak or sickly condition, are not exempted from being attacked by them. When examining a gathering of living Entomostraca in which Ostracoda are frequent, we may occasionally observe a number of these minute Crustaceans crowding round some object of general interest, and, when the reason for the crowding is investigated, find that they are busy feeding on a dead or dying companion.

* Les Poissons des côtes de Belgique leurs Parasites et leurs Commenceaux, pp. 14, 15 (1870).

But although such incidents are not of rare occurrence among the Entomostraca, the example to which I would direct attention, where a post-larval fish is apparently being attacked by two members of the family Polyphemedæ, is somewhat unusual. Larval and post-larval fishes have no doubt many enemies, among which may be included other fishes as well, and it has also been shown that even the harmless-looking *Sagittæ* feed upon such larvæ,† but this is the first time I have observed Entomostraca presumably attacking a post-larval fish in the manner shown by the drawing.

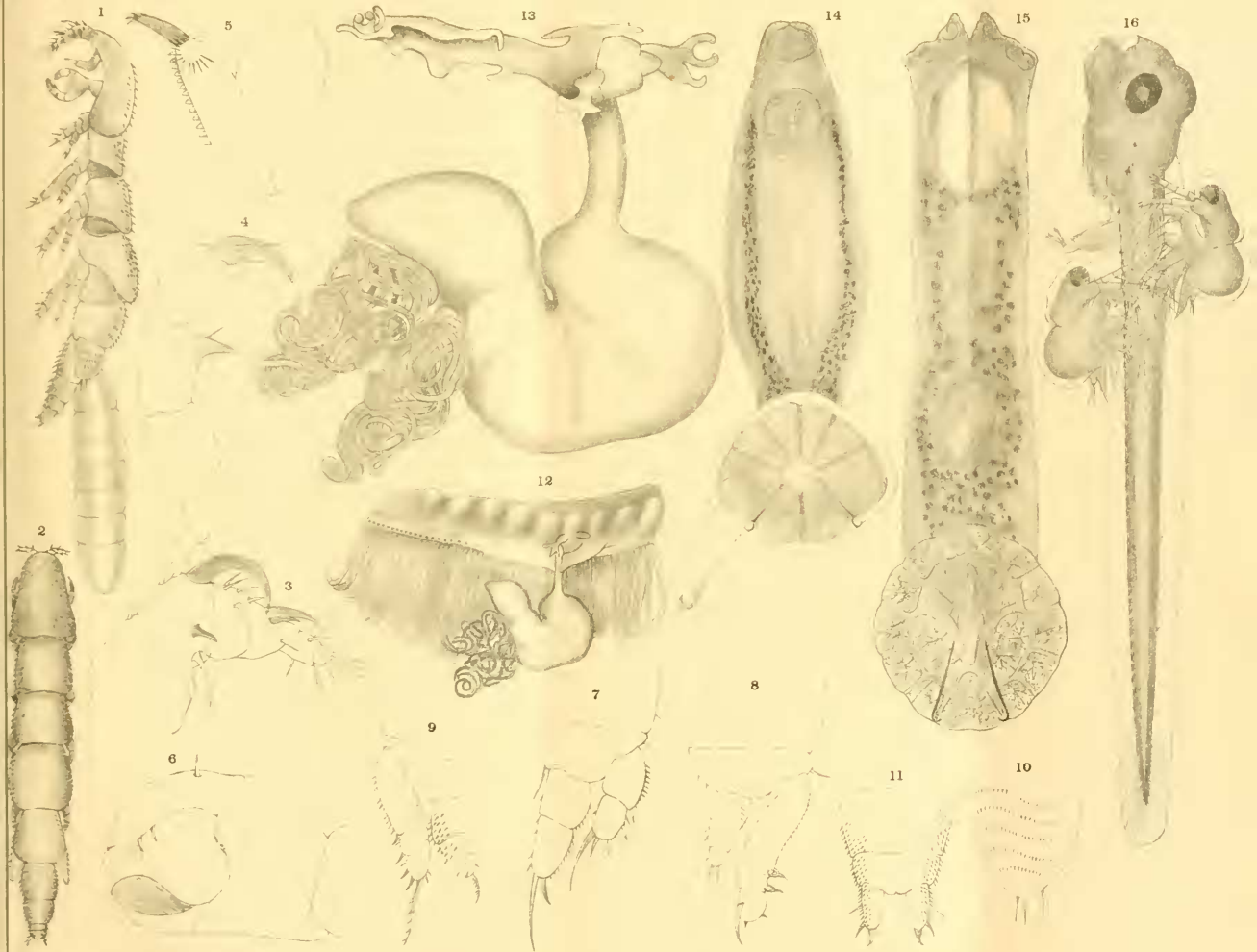
As stated in the preliminary note, I am indebted to Dr. Williamson for this interesting specimen. The fish, he tells me, is a Pleuronectid—probably *Pleuronectes platessa*—but its emaciated condition made its correct identification somewhat doubtful. That these Crustaceans have become accidentally attached to the specimen is hardly likely, for the position they occupy and the firm hold they have of the fish, evidenced by their adhering while extraneous matter was being brushed off, and by their continuing to adhere firmly though subjected to a good deal of tossing about, does not favour such an explanation, but tends rather to support the opinion that they have intentionally seized hold of the young Pleuronectid, but whether for the purpose of attacking or merely for resting I am not prepared to say. The specimen is, however, sufficiently interesting to be recorded here. The fish was observed in a tow-net gathering collected last year and supposed to be from the North Sea. The two Crustaceans belong to the same species, viz., *Podon leuckarti*.

*Annals of Scottish Natural History, April, 1892, p. 142.

DESCRIPTION OF THE PLATES.

PLATE XVII.

		Diam.
	Eudactylina minuta.	
Fig. 1.	Female, side view,	× 79·5
Fig. 2.	Female, dorsal view,	× 61
Fig. 3.	Antennule,	× 521
Fig. 4.	Antenna,	× 521
Fig. 5.	First maxilliped,	× 521
Fig. 6.	Second maxilliped,	× 390
Fig. 7.	Foot of first pair,	× 521
Fig. 8.	Foot of second pair,	× 260
Fig. 9.	Foot of fourth pair,	× 260
Fig. 10.	Foot of fifth pair,	× 260
Fig. 11.	Furcal joints and last two segments of abdomen,	× 260
	Lernæ lusci.	
Fig. 12.	Female, side view,	× 9
Fig. 13.	Parasite on gill of *Gedus luscus*,	× 3
	Trematodes.	
Fig. 14.	*Thaumatocotyle concinna*,	× 95·5
Fig. 15.	*Heterocotyle pastinacæ*,	× 53
Fig. 16.	Larval fish with two specimens of *Podon leuckarti* attached to it,	× 39·75



A. SCOTT, *del. ad nat.*